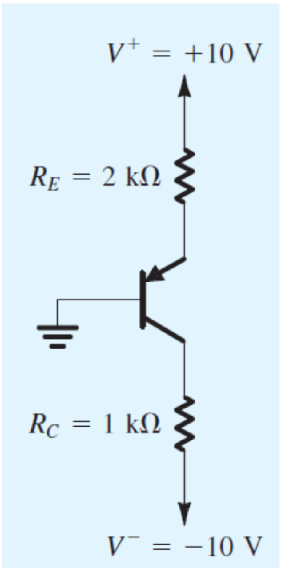
David Kirby

ECE322L-Homework 5 (100 points)
Assigned on Thursday, 02/27/2020-11 am
Due on Thursday, 03/05/2020-11 am

Problem (60 pts.)

For the circuit below find the largest value that Rc can be raised to with the transistor still remaining in active mode. In addition, redesign the circuit to establish a collector current of 1 mA and a reverse bias on the collector-base junction of 4 V. Assume $\alpha \approx 1$



(a) $$I_E \frac{V^+ - V_E}{R_E} = \frac{10V - 0.7V}{2k\Omega} = 4.65mA$$

$$I_C = \alpha I_E = 0.99 \times 4.65mA = 4.6035mA$$

$$R_C = \frac{V^+ - V_{BC}}{I_C} = \frac{V^+ - (V_{EC} - V_{EB})}{I_C} = \frac{10V - (0.3V - 0.7V)}{4.6035mA} = 2.2592k\Omega$$

(b) $$V^+ - I_E R_E - V_{EB} = 0 \quad \rightarrow \quad R_E = \frac{V^+ - V_{EB}}{I_E} = \frac{10V - 0.7V}{1mA} = 9.3k\Omega$$

$$R_C = \frac{-V^- - V_{BC}}{I_C} = \frac{-(-10V) - 4V}{1mA} = 6k\Omega$$

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Questions (40 pts.)
Circle the correct answer or fill the blanks.

1. In a bipolar npn transistor, when the base-emitter junction is forward biased and the collector-base junction is reverse biased, the BJT is said to be in the

a. Forward-active mode

b. Reverse-active mode

c. Cut-off

d. Saturation

2. The common emitter-current gain is defined as ratio of

a. Collector current to Emitter Current

b. Emitter current to Collector Current

c. Collector current to Base Current

d. Base current to Emitter Current

3. Which one of the following statements is true for a BJT operating in the forward-active region?

a. Collector current is almost equal to the Emitter current

b. Emitter current is almost equal to the Base current

c. Base current is much larger than the emitter current

d. Base current is almost the same as the collector current

4. A bipolar pnp transistor is in forward-active mode when the base-emitter voltage is Reverse Bias and the base-collector voltage is Forward Bias.